

ESTIMATED WATER USE IN SOUTH-CENTRAL MISSOURI DURING 1971.

IN MILLIONS OF GALLONS PER DAY

Includes water pumped from the Missouri River and its alluvial valley by St. Louis and other users south of the river.

²Most water used for this purpose is not consumed and is available for reuse. Does not include

Category of

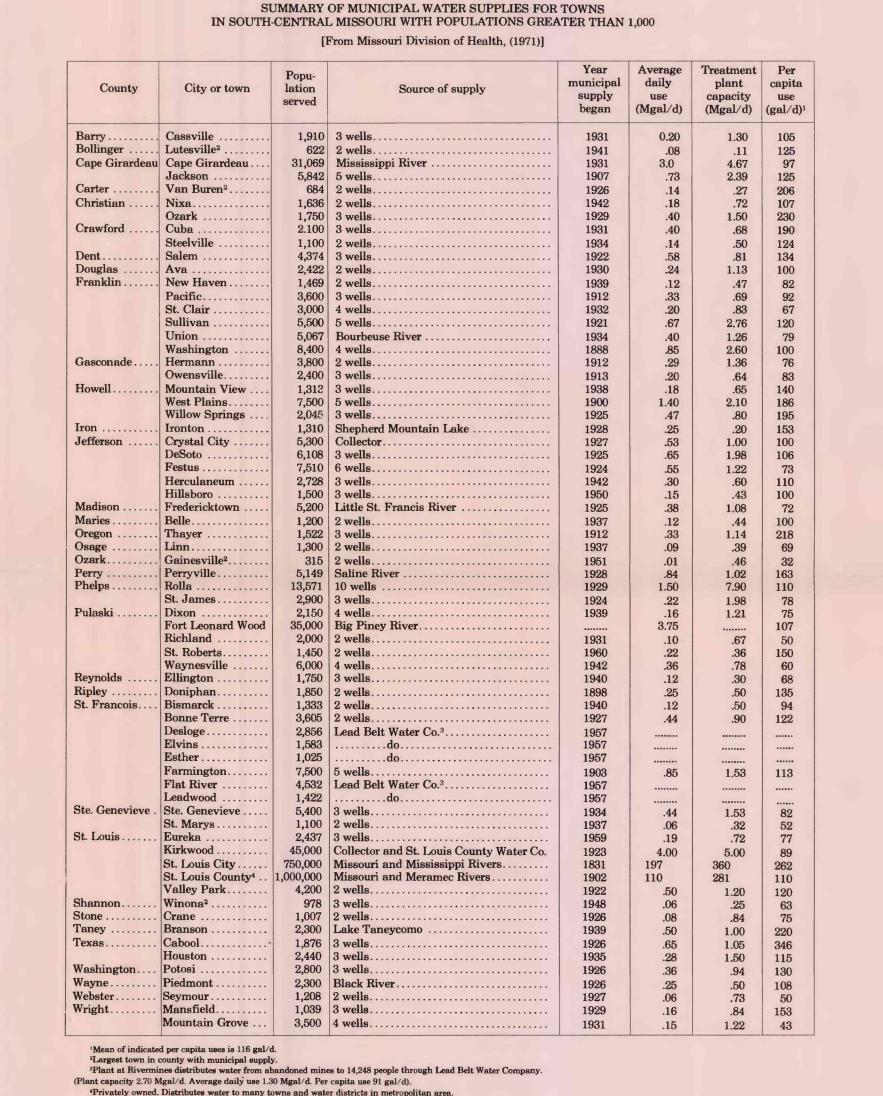
Electric power²...

Percent of total

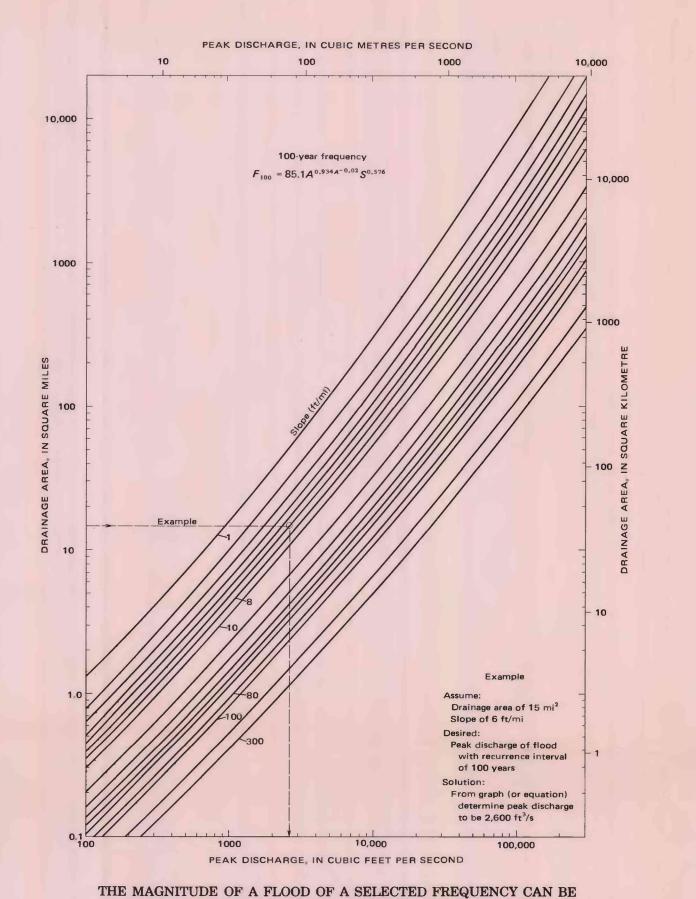
Base from U.S. Geological Survey,

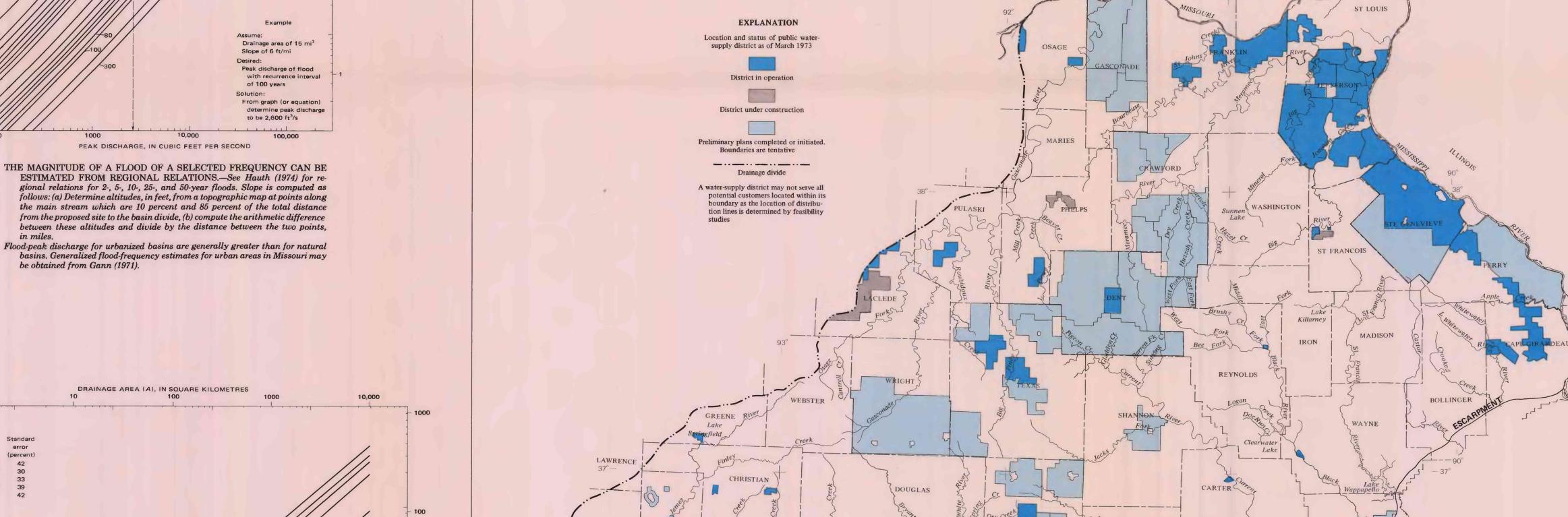
State base map, 1:500,000, 1971

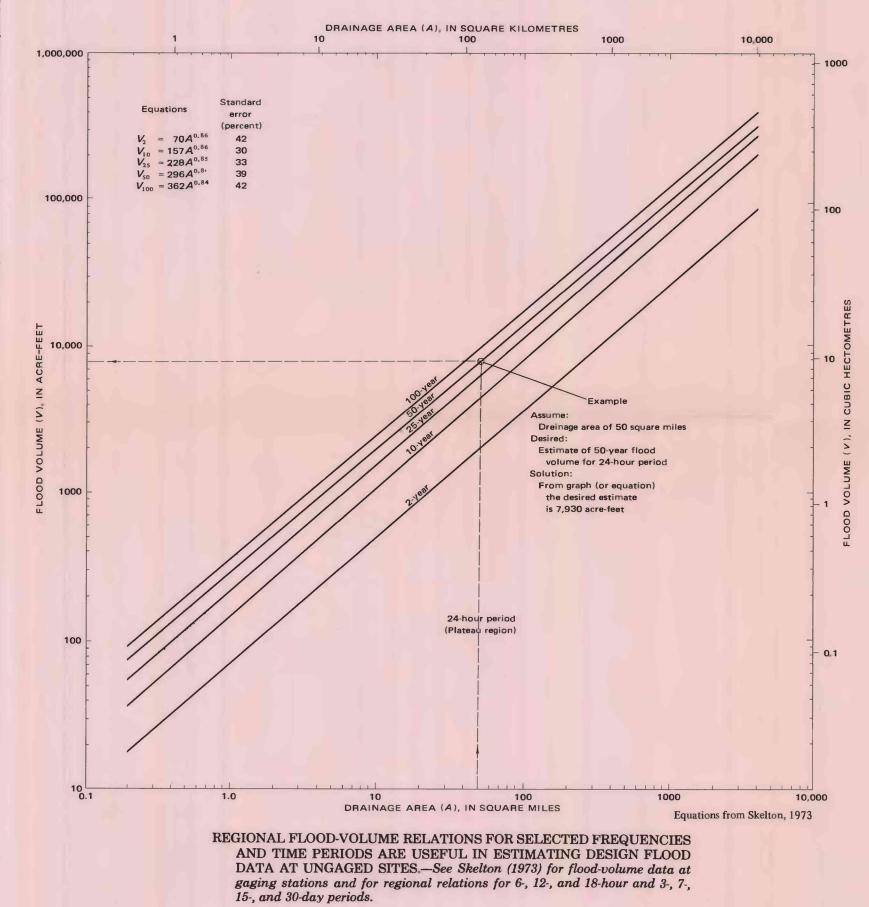
3Includes spring water used by fish hatcheries.



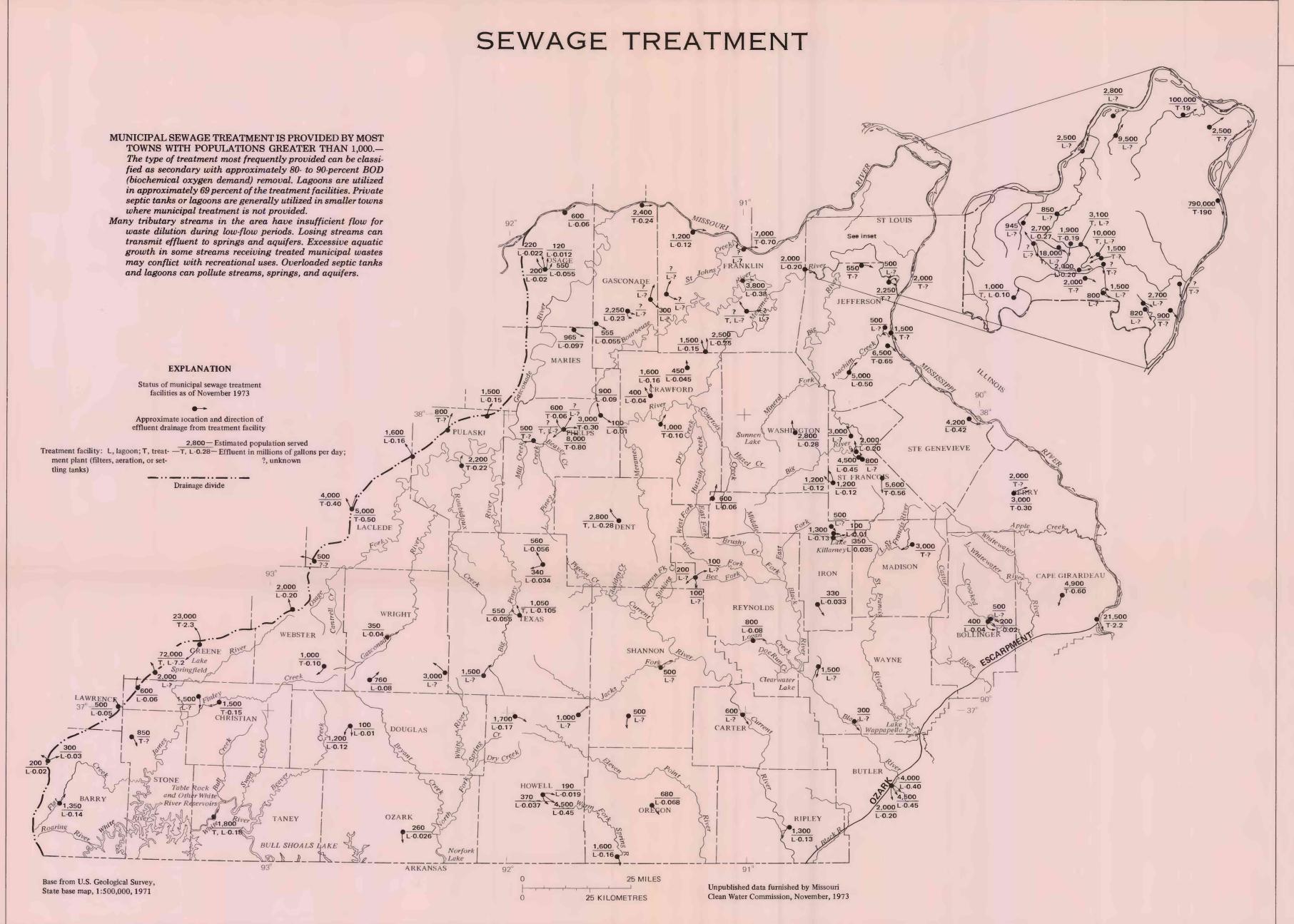
WATER USE







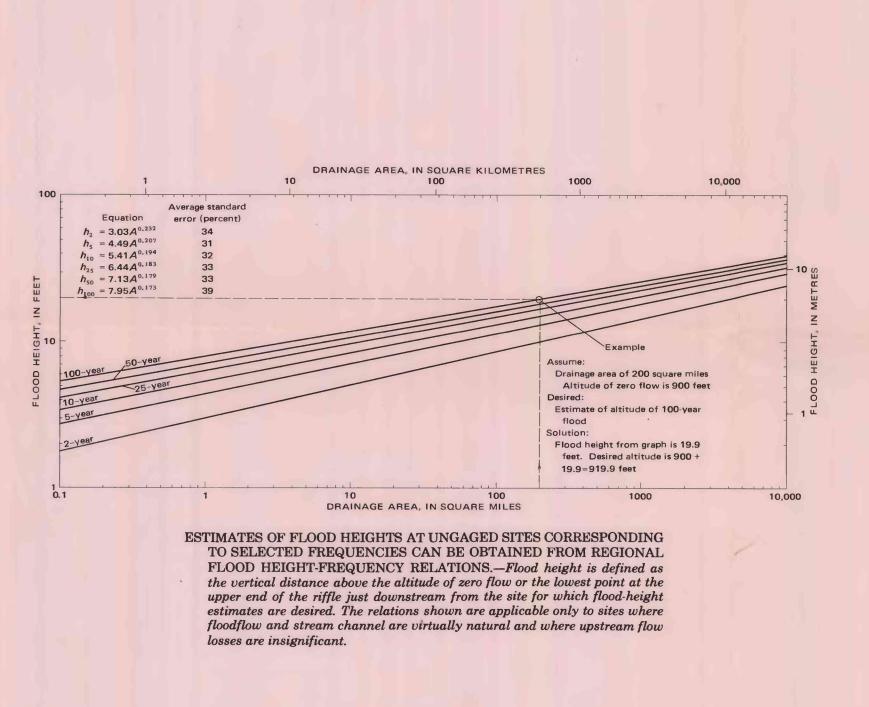
be obtained from Gann (1971).



25 KILOMETRES

Based on data furnished by Farmers Home

Administration and Missouri Division of



WATER RESOURCES OF SOUTH-CENTRAL MISSOURI

E. E. Gann and E. J. Harvey U.S. Geological Survey and D. E. Miller Missouri Geological Survey and Water Resources

Development problem	Alternatives	Considerations	Information needed	Selected source of information
Water supply	Streams	Flow characteristics of unregulated streams are highly variable. Low flows of principal streams are generally adequate for dependable supplies. Tributary streams are generally inadequate without low-flow augmentation. Yields of principal streams are among the highest in the State. Water quality of streams is variable; subject to contamination from surface sources. Treatment is required.	Low-flow data. Definition of losing and gaining streams. Time-of-travel studies. Storage estimates for low-flow augmentation. Water-quality data including sediment yield, biological, and trace-element data.	U.S.G.S. Mo. G.S. Mo. C.W.C. Mo. W.S.P. Corps
	Springs	Numerous large springs occur along principal streams. Several springs are used to supply water to fish hatcheries. Springs are fed by local solution openings and regional aquifers. Water-quality characteristics of springs are relatively stable. Unrestricted disposal of solid and liquid wastes in recharge areas is a potential hazard.	Springflow data. Water-quality data. Tracing studies to define recharge areas and determine rates of ground-water travel.	U.S.G.S. Mo. G.S. Forest Service Local spring owners
	Impoundments	May be used to supplement streamflow sources during periods of little or zero flow. Watershed should be protected. Treatment is required. Stratification may cause water-quality problems in impoundments deeper than about 25 feet (7.6 m). Proposed sites should have detailed geologic examination because of widespread cavernous conditions.	Hydrologic data for reservoir and spillway design for large and small impoundments. Knowledge of geologic, sedimentation, and seepage characteristics of proposed sites. Knowledge of chemical and biological changes occurring in impoundments.	U.S.G.S. Mo. G.S. Corps S.C.S. Mo. D.C.
	Aquifers	Alluvial aquifers of the Mississippi River valley are capable of yields in excess of 1,000 gal/min (63.1 l/s). Alluvial aquifers of lower Meramec River valley are capable of yields as great as 600 gal/min (37.9 l/s). Unconsolidated deposits in valleys of other principal streams such as Gasconade, Black, and Current Rivers may yield sufficient water for small municipal and domestic supplies. Water from alluvial aquifers generally has a high iron content. Lower Ordovician and Upper Cambrian aquifers yield 30 to 600 gal/min (1.89 to 37.9 l/s) to municipal and industrial wells in most of the area. Pennsylvanian, Mississippian, and Middle Ordovician aquifers yield sufficient water for domestic supplies in local areas. Owing to deep weathering, well casings must be cemented to depths as great as 1,000 feet (305 m) in some areas to prevent inflow and possible contamination from shallow aquifers. The dissolved solids concentration of bedrock aquifers is usually less than 500 mg/l, except in the northeastern part of the area where formations dip steeply to the east. Abandoned mines are a potential source of water.	Knowledge of hydraulic characteristics of aquifers. Potentiometric maps to indicate regional ground-water movement and recharge and discharge areas. Water-quality data for aquifers and abandoned mines.	Mo. G.S. U.S.G.S. Mo. W.S.P. Local well drillers
Flooding	Headwater and (or) mainstream reservoirs	Multiple-purpose reservoirs help meet water-supply, recreation, and power-generation needs. Federal participation usually required. Four reservoirs constructed in the area by the Corps of Engineers; another under construction. A smaller reservoir under construction by Forest Service. Five watershed projects in various stages of planning by Soil Conservation Service. Construction of reservoirs destroys farmland, wildlife habitat, and free-flowing condition of stream. Stratification may cause water-quality problems in reservoirs deeper than about 25 feet (7.6 m). Proposed sites should have detailed geologic examination because of widespread cavernous conditions.	Hydrologic data for comprehensive riverbasin planning. Streamflow data for reservoir design and operation. Geologic data for reservoir and dam sites. Sediment-yield data for predicting sedimentation rates. Precipitation and streamflow data for flood forecasting.	Corps S.C.S. U.S.G.S. Mo. G.S. Forest Service Mo. D.P.P.D. N.W.S.
	Levee construction and (or) channel improvements	May be accomplished by local or Federal interests. Used in conjunction with flood-control reservoirs and land-drainage projects. Requires maintenance for effective protection. Levees subject to failure during extreme floods and may increase flood heights for adjacent areas. Channelization alters natural flow regime of stream and may result in increased erosion and higher flood peaks. Destroys natural habitat of wildlife.	Hydrologic data for comprehensive riverbasin planning. Flood profiles of outstanding floods. Altitude-frequency studies for adequate design. Foundation and seepage studies of levee site.	Corps U.S.G.S. Mo. D.P.P.D. Mo. G.S.
	Flood-plain zoning	Reduces flood damages by regulating use of flood plains. Local cooperation necessary for success. Requires supervision and enforcement. Maximum benefit in urban areas.	Definition of flood-prone areas to increase public awareness of local flood hazards. Historical and design flood profiles and altitude-frequency studies for establishing adequately zoned areas.	Corps Mo. D.P.P.D. U.S.G.S. F.I.A.
	Flood proofing	Reduces flood damages for flood-plain structures. Advance flood warning necessary for implementation of emergency flood-proofing procedures.	Definition of flood-prone areas to increase public awareness of local flood hazards. Historical and design flood profiles to indicate high-water altitudes.	Corps Mo. D.P.P.D. U.S.G.S.
	Flood insurance	Provides limited financial protection against flood losses in urban communities while inducing the adoption of land-use control measures to reduce future flood damage.	Design flood profiles and altitude-frequency studies for establishing flood insurance rates.	F.I.A. Mo. D.P.P.D. Corps U.S.G.S. S.C.S.
Pollution	Waste-water treatment	Required by State water-quality standards. Supervision and enforcement necessary. Secondary treatment provided by most towns in area with population in excess of 1,000. Natural flow of several tributary streams inadequate for waste dilution during low-flow periods. Inadequate lagoons and septic tanks pollute streams, springs, and aquifers.	Low-flow characteristics of streams. Storage requirements for low-flow augmentation. Definition of assimilative capacity of streams. Geologic data for lagoon sites. Water-quality monitoring of streams, springs, and aquifers.	Mo. C.W.C. E.P.A. U.S.G.S. Mo. G.S.
	Irrigation with treated wastes	Hazardous in karst terrane without adequate information concerning soil thickness and infiltration rates and permeability of underlying bedrock. Requires proper design and operation.	Hydrologic, geologic, and soils data for pro- posed disposal areas. Monitoring of surface-water and ground-water quality in vicinity of irrigated area.	Mo. G.S. Mo. C.W.C. E.P.A. U.S.G.S.
	Underground waste disposal	Waste-injection wells prohibited by 1971 State law. Lagoons and septic tanks contaminate ground-water resources if inadequately designed, constructed, or operated. Restoration of contaminated aquifers is expensive and may require many years.	Hydrologic, geologic, and soils data for pro- posed disposal areas. Monitoring of water quality and movement in receiving formations.	Mo. C.W.C. Mo. G.S. E.P.A. U.S.G.S.
	Sanitary landfills	Location and operation are regulated by State law. Abandoned, formerly unregulated dumps, particularly in sinkholes, are a potential hazard to aquifers, springs, and streams.	Hydrologic, geologic, and soils data for pro- posed disposal areas. Monitoring of water quality and movement in receiving formations.	Mo. C.W.C. Mo. G.S.
	Reduction of agricultural pollution	Herbicides and insecticides are toxic to aquatic life. Fertilizers and feed-lot wastes can pollute streams and aquifers and provide nutrients for excessive plant growth. Sediment loads of streams are affected by poor farming practices.	Knowledge of effects of fertilizers, herbicides, insecticides, and animal wastes on quality of water in streams, aquifers, impoundments, and springs. Sediment-yield data for streams.	Mo. C.W.C. E.P.A. Mo. G.S. U.S.G.S. Univ. of Mo. Extension I
	Prevention of saline-water encroachment	Excessive pumping from consolidated aquifers in northeastern part of area may induce encroachment of saline water from the northeast and east.	Potentiometric maps to indicate regional ground-water movement and recharge areas. Knowledge of hydraulic characteristics of aquifers. Pumpage data. Water-quality monitoring of aquifers in vicinity of fresh-water boundary.	Mo. G.S. U.S.G.S. Mo. W.S.P. Local well drillers
	Proper mining techniques	Drainage and erosion from strip-mined areas and tailing piles and discharge of mine waste water may pollute streams and aquifers. Heavy mine pumpage may lower ground-water levels in local areas. Base flow of streams receiving mine pumpage may be increased during life of mining district. Reclamation of mining areas enhances esthetic values, provides recreation areas, and results in more efficient use of land and water resources.	Water-quality monitoring of streams and aquifers in mining areas. Monitoring of ground-water levels. Knowledge of hydraulic characteristics of aquifers. Potentiometric maps and mine pumpage data.	Mo. G.S. Mo. C.W.C. U.S.G.S. Univ. of Mo. Local mining companies
	Prevention and containment of accidental spills	Release of large quantities of potentially hazardous substances following transportation and storage accidents may contaminate streams, springs, and aquifers. Potential for contamination of springs and aquifers is especially great where sinkholes and losing streams exist.	Hydrologic and geologic data for potential accident areas (major transportation routes and storage areas). Time of travel and dispersion studies for streams. Ground-water tracing data. Potentiometric maps.	Mo. C.W.C. E.P.A. Mo. G.S. U.S.G.S.
Recreation	Streams	Principal streams widely used for floating, fishing, and fish propagation. Current River and Jacks Fork included in Ozark National Scenic Riverways administered by National Park Service. Eleven Point River designated a Wild River administered by U.S. Forest Service. Other important floating and fishing streams include Gasconade, Big Piney, Meramec, Big, St. Francis, Black, and North Fork Rivers.	Flow characteristics of streams. Water-quality data. Knowledge of hydrologic relationship between streams, springs, and aquifers.	U.S.G.S. Mo. G.S. Mo. C.W.C. Mo. D.C. Forest Service Corps
	Springs	Principal springs included in Federal, State, or privately owned parks. Public trout fishing provided at Maramec, Montauk, Roaring River, Lane, and Roubidoux Springs. Many privately owned springs used in fish hatchery and aquatic-plant developments and for private recreation areas.	Flow characteristics of springs. Water-quality data. Knowledge of hydrologic relationship between springs, streams, and aquifers.	U.S.G.S. Mo. G.S. Mo. D. C.
	Lakes	May be combined with flood control and water supply. Approximately 330 lakes, mostly manmade, with surface areas in excess of 5 acres (2.02 hm²) are known to exist in the area. Wappapello, Clearwater, Table Rock, Bull Shoals and Norfork Reservoirs and Lake Taneycomo offer water-based recreation facilities. Several reservoirs authorized for future construction.	Hydrologic and geologic data for design of large and small lakes. Sediment-yield data for streams. Knowledge of chemical and biological changes occurring in lake environments.	Mo. D.C. Corps U.S.G.S. Mo. G.S. S.C.S.
Jrbanization	Planned development with consideration of effects on water resources	Necessary in preventing depletion and pollution of streams, springs, and aquifers in urbanizing areas. Alteration of natural surface storage and drainage may increase flood heights and shorten arrival time of flood peaks. Present or potential problem areas include (but are not limited to) St. Louis, Jefferson, Franklin, and Greene Counties.	Hydrologic data for predicting the effects of urbanization on the water resources of individual areas. Comprehensive water-resources studies of present and potential problem areas.	U.S.G.S. Mo. G.S. E.P.A. Corps Local municipalities Regional

¹Corps, Corps of Engineers; E.P.A., Environmental Protection Agency; F.I.A., Federal Insurance Administration; Mo. C.W.C., Department of Natural Resources, Division of Enrivonmental Quality, Clean Water Commission; Mo. W.S.P., Department of Natural Resources, Division of Environmental Quality, Water Supply Program; Mo. D.P.P.D., Department of Natural Resources, Division of Planning and Policy Development; Mo. G.S., Department of Natural Resources, Geological Survey; Mo. D.C., Missouri Department of Conservation; N.W.S., National Weather Service; S.C.S., Soil Conservation Service; U.S.G.S., U.S. Geological

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